[DOCUMENT] SPECIFICATION

[TITLE OF THE INVENTION]

PIEZOELECTRIC OSCILLATOR

[DETAILED DESCRIPTION OF THE INVENTION]

[Technical Field of the Invention]

The present invention relates to a piezoelectric oscillator capable of providing a sine wave output.

[Prior Art and Problems to be Solved by the Invention]

In recent years, widely used in the electronics field are piezoelectric oscillators each adopting a piezoelectric element, such as a quartz oscillation element, as a frequency determination element.

Oscillators of this type have high frequency stability, and hence are used as reference sources for frequency and time in various electronic instruments.

Meanwhile, in a recent trend, regulations have tended to tighten for electromagnetic radiation from electronic instruments. Thus, also in piezoelectric oscillators, radiation needs to be reduced as much as possible.

Nevertheless, a conventional piezoelectric oscillator according to the prior art is composed of a C-MOS integrated

circuit, which outputs a rectangular pulse wave. Such a rectangular pulse wave contains a large amount of higher harmonic components, and thereby has caused a problem in high level radiation to the outside.

[Objects of the Invention]

In consideration of the above-mentioned situation, an object of the invention is to provide a piezoelectric oscillator having a reduced amount of higher harmonic components and hence a reduced amount of radiation to the outside.

[Summary of the Invention]

In the invention, the output of an oscillation circuit is output through a filter, whereby a sine wave output is obtained.

[Embodiments of the Invention]

An embodiment of the invention is described below in detail with reference to an elevation cross sectional view of the entire apparatus shown in Figure 1 and a perspective view of a piezoelectric element shown in Figure 2.

In the figure, numeral 1 indicates a bottom metal plate. Through each terminal hole in the bottom plate 1, a terminal 2 is inserted and then fixed by hermetic glass 3 or the like in a manner integrated with but insulated from the bottom plate 1. A base 4 composed of a ceramic or the like is placed on

the top surface of the bottom plate 1. On the plate surface of the base 4, an electric conduction pattern is formed in advance. The end portion of each terminal 2 is inserted through each attachment hole provided in the base 4 in the position corresponding to the terminal 2. Each terminal 2 is then retained and fixed by soldering or the like.

Numeral 5 indicates a pedestal provided on the base 4. A piezoelectric element 6 is placed on the pedestal 5. The center portion of this element is fixed by adhesive or the like.

As shown in the perspective view of Figure 2, on the piezoelectric element 6, an oscillation element 6a is formed on one side, while a filter 6b such as a monolithic filter is formed on the other side. The electrodes thereof are drawn to the center portion of the bottom surface, and then connected through an electric conduction pattern formed on the side surface of the pedestal 5, to the pattern on the plate surface of the base 4.

Electronic components, such as chip-type resistors, capacitors, and transistors, are assembled on the top surface of the base 4, and thereby constitute an oscillation circuit 7 using the oscillation element 6a as a frequency determination element. The output of the oscillation circuit 7 is input to the filter 6b formed on the other side on the piezoelectric

element 6, as shown in the block diagram of Figure 3.

The output of the filter 6b is output through the terminal 2 to the outside. In this configuration, even when the output of the oscillation circuit 7 is a rectangular wave, the output passes through the filter 6b, and is thereby converted into a sine wave. This process substantially reduces radiation to the outside.

Further, the oscillation element 6a and the filter 6b are formed on the same piezoelectric substrate 6, and thereby have the same temperature coefficient can be obtained. Accordingly, even when temperature changes causes a change in the respective resonance frequencies, the resonance frequency of the oscillation element 6a is always maintained within the frequency band of the filter 6b.

Furthermore, since the piezoelectric element 6 is retained in the center portion thereof, when this retaining is sufficiently rigid, acoustic coupling between the oscillation element 6a and the filter 6b is minimized, whereby mutual interference is avoided. Further, the piezoelectric element 6 is sufficiently retained mechanically.

In the above-mentioned embodiment, as illustrated in the perspective view of the piezoelectric element 6 shown in Figure 2, the oscillation element 6a is arranged in the direction

perpendicular to the wave propagation direction of the monolithic filter. This minimizes the mutual interference. Accordingly, even when a piezoelectric element 6 of small size is used, coupling between the components is reduced, and degradation in the characteristics is prevended.

The invention is not restricted to the above-mentioned embodiment. For example, as illustrated in a perspective view of a piezoelectric substrate shown in Figure 4, a ground electrode 8 may be formed in the center portion of the top surface of the piezoelectric substrate in order to shield between an oscillation element 6a and a filter 6b.

Further, the above-mentioned embodiment has been described for the case of a monolithic filter. However, the invention is not restricted to this. A filter of a single resonance type may be used.

[Effects of the Invention]

As described above in detail, the invention permits a piezoelectric oscillator with simple configuration which provides a sine wave output and thereby reduces radiation to the outside.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Figure 1 is an elevation cross sectional view showing an embodiment of the invention.

Figure 2 is a perspective view showing a piezoelectric element according to the invention.

Figure 3 is a block diagram showing the electric configuration according to the invention.

Figure 4 is a perspective view showing a piezoelectric element according to another embodiment of the invention.

[Description of the Reference Numerals]

1···Bottom plate

2···Terminal

4···Base

5···Pedestal

6a···Piezoelectric element

6b···Filter

7···Oscillation circuit

8···Ground electrode